

## SECTION 4. ACADEMIC RANK

There is substantial evidence that women, as a group, are underrepresented in senior academic ranks. The modeling issues discussed below should be considered when interpreting the results of empirical research on advancement to senior academic ranks.

### MODELING ISSUES

Many of the studies on academic rank that we reviewed attempted to determine the effects of gender on academic rank after controlling for the effects of other factors that might affect promotions (e.g., experience and scholarly production). In most cases, these studies employed one of two kinds of analyses: discrete outcome models or hazard models.

Discrete outcome models permit multivariate analyses of outcomes that are observed as discrete events. This kind of model is appropriate for analyses of discrete career outcomes, such as academic rank or tenure (e.g., the individual is either tenured or not tenured). Two kinds of commonly used discrete outcome models are logit analysis and probit analysis.<sup>23</sup> Long (2001), Olson (1999), and Raymond et al. (1993) all used logit analysis in their studies of academic rank. Ransom and Megdal (1993), McDowell and Smith (1992), and Farber (1977) used probit analysis. Logit and probit analyses allow researchers to estimate, for example, the effect that gender has on the probability of being promoted to the rank of full professor after controlling for other factors that might affect rank, such as experience or scholarly productivity.

Hazard analysis is a useful tool for analyzing factors that affect the length of time required to achieve a given academic rank.<sup>24</sup> Both Weiss and Lillard (1982) and Kahn (1993) used hazard analysis in their studies of academic rank. Hazard analysis allows the researcher to estimate, for example, the effect that gender has on the time required to reach the rank of full professor after controlling for other variables affecting promotions.

The kinds of control variables used in the literature on academic rank are similar to those used in salary stud-

ies and include measures of human capital, measures of productivity, personal characteristics, and academic field.

### HUMAN CAPITAL VARIABLES

The rationale for including human capital variables as controls in studies of academic rank (and tenure status) is similar to the rationale for their inclusion in salary studies. Other things being the same, one would expect that individuals who have accumulated more human capital are more likely to receive tenure and to be promoted to senior ranks.

#### Experience

The number of years elapsed since earning the doctorate is perhaps the most commonly used measure of experience in academic rank studies. McDowell and Smith (1992), however, included a variable measuring years of academic experience in their study. Several authors, including Ransom and Megdal (1993) and Raymond et al. (1993), included years of service at the employing university as an institution-specific measure of experience.

#### Education

Some studies of academic rank include measures of educational quality as controls. For example, Long (2001) controlled for the prestige of the doctorate-granting institution in his study of tenure and promotions. Olson (1999) included as controls post-doctoral appointments and the Carnegie classification and departmental rankings of the doctorate-granting institution. Broder (1993) also controlled for the quality of the department from which individuals earned doctorates. When data included faculty who had not earned doctorates, some studies included control variables for the highest degree earned.

#### Characteristics of Employing Institution

Several studies, including Long (2001), Olson (1999), Broder (1993), Kahn (1993), and McDowell and Smith (1992) controlled for the characteristics of the employing institution. These controls could be interpreted as measures of human capital, given that individuals who have accumulated the most human capital are most likely to be employed at the most prestigious universities. In studies of academic rank, however, employer characteristics are probably better interpreted as proxies for variations in tenure and promotion requirements. Because promotion requirements are likely to be most

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<sup>23</sup>Logit and probit analyses are similar statistical tools but differ in assumptions about the distributions of random modeling error.

<sup>24</sup>Hazard analysis, sometimes referred to as duration analysis, is superior to ordinary least squares regression analysis in that it can deal with censored observations. Observations on the length of time between promotions are censored in that individuals who have not yet been promoted are still observed in lower ranks.

stringent at the most prestigious institutions, institutional quality is likely to be negatively related to the probability of being promoted.

## MEASURES OF PRODUCTIVITY

Many of the studies of academic rank we reviewed controlled for scholarly productivity, but few controlled for teaching output and those that did used relatively simple controls. Only one of the studies reviewed included any controls for service to the academic community.

### Scholarly Productivity

As in the salary studies, most of the academic-rank studies we reviewed used simple counts of the number of articles published as measures of scholarship. Olson (1999) controlled for the number of papers presented at conferences as well as the number of publications. Raymond et al. (1993) included research grant money awarded. Studies by Olson (1999) and Farber (1977) included indicators that research was the primary work activity as controls.

### Teaching

As noted above, controls for teaching output are relatively rare and are simple in the academic-rank studies we reviewed. Two studies, Olson (1999) and Farber (1977), controlled for teaching as a primary work activity.

## PERSONAL CHARACTERISTICS

Generally, fewer academic-rank studies than salary studies controlled for personal characteristics. A few studies controlled for such factors as age, age at the time of earning the doctorate, and race/ethnicity. Unfortunately, only three studies, Long (2001), Olson (1999), and Winkler et al. (1996), included marital and parental variables.

## FINDINGS

Table 4-1 summarizes the findings of multivariate studies of the effects of gender on academic rank. Each of the studies listed in this table controls for at least some measure of experience and academic field.<sup>25</sup> The first

column in Table 4-1 identifies the years covered by each study. The second column briefly summarizes the findings of each study.<sup>26</sup>

Taken as a whole, the findings from the literature suggest that, other things being the same, female faculty find it more difficult than male faculty to achieve tenure and to be promoted to senior academic ranks. Of the studies that we have reviewed, only two found no statistically significant gender differences in promotion rates. Raymond et al. (1993) found no evidence of gender having an effect on academic rank, but this study used data for a single institution. A study by McDowell and Smith (1992), who used data for only the field of economics, found no statistical difference in promotion rates between men and women after allowing for gender differences in the effect of experience on academic rank. They did find that women receive less credit for experience than men do. Interpreting gender differences in returns received from experience has raised controversy in the literature. Gender differences in credit for experience could be due either to gender differences in human capital accumulation (caused by family responsibilities and workforce interruptions) or to gender bias.

The findings from some of the studies we reviewed suggest that women faculty are placed at a particular disadvantage by family responsibilities during child-rearing years. For example, Farber (1977) found that women receive significantly fewer promotions when they are young but found no significant differences in promotion rates for older women. McDowell and Smith (1992) concluded that promotion rates for women are lower than those for men because women receive less credit for years of experience. Gender differences in family responsibilities may be responsible for this finding.

Kahn (1993) found that women are less likely than men to receive tenure but found no gender effect for the time between promotion from associate to full professor. The tenure decision, which usually coincides with promotion from assistant to associate professor, often occurs during early child-rearing years.

Long (2001) and Olson (1999) estimated separate promotion models for women and men and included con-

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<sup>25</sup>We adopted two criteria for including in Table 4-1 studies that we reviewed. First, the studies must include original empirical research on the relationship between gender and tenure or academic rank. Second, the studies must attempt to control for factors other than gender that might affect tenure and promotion.

<sup>26</sup>The results of the academic rank studies are more difficult to summarize quantitatively than are the salary studies. This is due in part to differences in modeling approaches across studies and the kinds of quantitative results reported by the authors.

trol variables reflecting the number of children at home. Olson found that having children significantly reduces the chances of promotions for women but not for men.

Long's results do not show consistent, statistically significant gender differences in relations between promotion rates and having children.<sup>27</sup>

Table 4-1. Estimates of gender differences in rank and tenure

Year <sup>1</sup>	Findings	Fields included	Modeling technique	Source
1960–1966	Compared with men, women receive fewer promotions when under age 40; promotions comparable at ages 40–50	Several S&E fields	Probit analysis	Farber (1977)
1960–1970	Women wait twice as long as men to be promoted	Several S&E fields	Hazard analysis	Weiss and Lillard (1982)
1969–1984	Women less likely than men to be in senior ranks; promotion rates of women about the same as for men with 1–2 years less experience	All academic fields	Probit analysis	Ransom and Megdal (1993)
1969–1986	Women's experience counts less for promotions than men's	Economics	Probit analysis	McDowell and Smith (1992)
1973, 1983	Women less represented at full professor level (20% to 59%)	Chemistry	Descriptive statistics	Everett et al. (1996)
1979, 1989, 1995	Women less likely to be full professor, tenured, or on tenure track	All S&E fields	Logit analysis	Long (2001)
1983–1987	Gender does not affect likelihood of promotion	All academic fields	Logit analysis	Raymond et al. (1993) <sup>2</sup>
1988–1989	Women with more than 6 years of postdoctoral experience more likely than men to be in lower ranks	Economics	Logit analysis	Broder (1993)
1989	Women less likely to be tenured; no gender effect for time between tenure and full professor rank	All S&E fields	Hazard analysis	Kahn (1993)
1989	Women make up 51% of instructors, 38% of assistant professors, 28% of associate professors, and 13% of full professors; also less likely to be tenured or on a tenure track	Several academic fields	Descriptive statistics	Carnegie Foundation (1990)
1990	Women disadvantaged with respect to rank and tenure	Several S&E fields	Regression analysis	Sonnert and Holton (1995)
1992	Small number of women associate professors	Atmospheric sciences	Descriptive statistics	Winkler et al. (1996)
1993	About 21% of women employed at full professor compared with 62% of men	Chemistry	Descriptive statistics	Everett et al. (1996)
1995	Women less likely to be full professor, in senior ranks, <sup>3</sup> tenured, or on tenure track	All S&E fields	Logit analysis	Olson (1999)
1997	Women more likely to be employed as instructors and assistant professors	Geosciences	Descriptive statistics	Ongley et al. (1998)

<sup>1</sup>Indicates years covered by data used in study.

<sup>2</sup>Study conducted for a single academic institution.

<sup>3</sup>Senior ranks include associate- and full-professor ranks.

**KEY:** S&E = science and engineering

<sup>27</sup>Neither Long nor Olson standardized the timing of when children are observed during the postdoctoral career. The timing of fertility might affect the influence that children have on academic careers (e.g., having children before or after the tenure decision).